Nondestructive Evaluation Program

NDE of Ablative Heat Shield Materials and Structures for NASA Missions

Completed Technology Project (2011 - 2013)

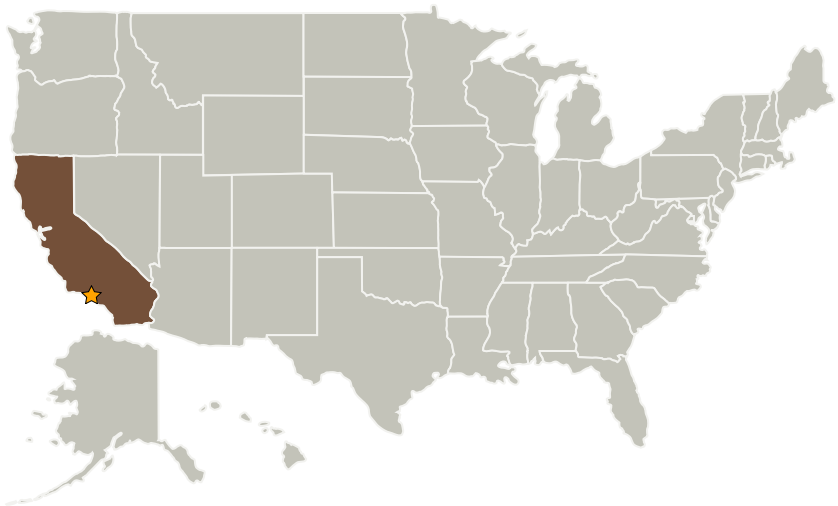
Project Introduction

Ablative thermal protection system (TPS) material is a critical component to NASA for Human Rating Requirements (HRR) for Follow-On Vehicles and for planetary missions. Ablative materials ensure the safety of the spacecraft and its contents – whether it is human or scientific instrumentation. These materials burn away (or ablate) at high temperatures, to carry off much of the extreme heat. The ablator's surface pyrolyzes when heated, leaving a heatresistant layer of charred material. The remaining thickness of virgin material has a low thermal conductivity to block heat transfer to the space craft, protecting its cargo. The two primary ablative materials that have been selected by NASA are: PICA (Phenolic Impregnated Carbon Ablator) and Avcoat. Both materials proved successful in previous missions to space. Both materials present challenges in manufacturing that produce defects which could effect mission success. NDE methods are proposed to identify those defects. Product(s) • Determination of minimum critical manufacturing flaw (defect) that will reduce the integrity of the Heat Shield attachment to spacecraft, i.e., reduce strength below acceptable. • Method to measure minimum critical flaw size. • Method to determine heat shield material tiles are shaped into proper shape prior to adhesion to spacecraft. • Method to detect low density areas of ablative materials as well as depth location of defect into the material.

Anticipated Benefits

Improved TPS quality control during manufacturing, and NDE evaluation techniques.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Office of Safety and Mission Assurance (OSMA)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Nondestructive Evaluation Program

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Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Management

Program Director:

Terrence W Wilcutt

Program Managers:

Jeannette F Plante
Jason P Moore
Eric R Burke

Project Manager:

Jose C Abesamis

Technology Areas

Primary:

- TX14 Thermal Management Systems
  - TX14.3 Thermal Protection Components and Systems
    - TX14.3.1 Thermal Protection Materials